RIVERWAYS PROGRAM

# RIFLS ROUNDUP

**River Instream Flow Stewards 2006 Annual Report**

*The mission of the Riverways Programs is to promote the restoration and protection of the ecological integrity of the Commonwealth's rivers, streams and adjacent lands. All the Riverways Programs are based on the belief that local action is key to river protection. Riverways staff work side-by-side with local citizens, town officials and watershed associations to achieve the goals of restoration and protection of the state's riverine ecosystems. Goals include (1) protecting and restoring water quality, (2) protecting healthy stream flows; (3) protecting land along rivers and streams, (4) improving habitat for wildlife and fish in river corridors; (5) promoting pubic access to and/or along rivers for river-friendly recreation.*

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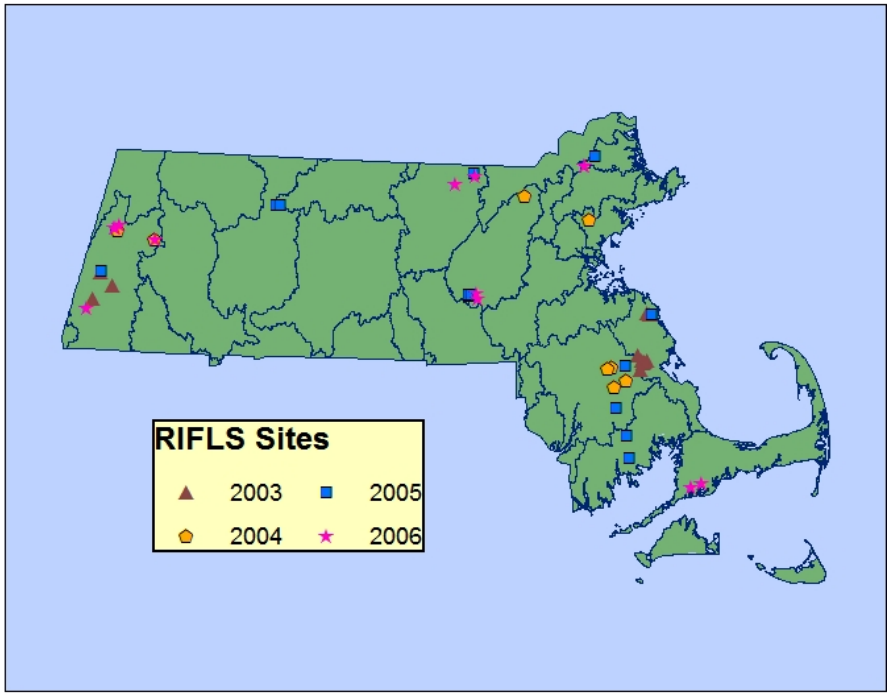
**RIFLS Sites by Year**




**Riverways' River Instream Flow Stewards (RIFLS) is an innovative, science-based program that addresses the harm caused to rivers and streams by depleted or altered stream flow.** Stream flow has been a hot topic during recent years, and even during wet years some rivers and streams have run dangerously low or dry due to poor water resource management, increasing development, and wasteful practices such as excessive lawn irrigation. To address the need for flow data in local decision-making, RIFLS brings together a diverse group of partners and provides technical assistance to document and restore stream flow.

## Partnerships

Protecting and restoring more natural stream flows can be a daunting task and one that requires the cooperation of many groups. Partnerships are a key component of the RIFLS program; they raise awareness about the importance of natural stream flow regimes and enable stream flow data to be used to improve habitat, water quality, and water quantity. Through local steering committees, this year's RIFLS partners were able to enhance other ongoing initiatives and develop stronger ties to their river communities.

***2006 RIFLS Participants & Partners***

- Bridgewater State Watershed Access Lab
- Cedar Swamp Conservation Trust
- Coalition for Buzzards Bay
- Coonamessett River Restoration Project
- Eel River Watershed Association
- First Herring Brook Watershed Initiative
- Friends of Whitehall
- Housatonic Valley Association & Friends of the Williams River
- Jones River Watershed Association
- Lake Shirley Improvement Corporation
- Lynn Water and Sewer Dept. & Saugus River Watershed Council
- Nashua River Watershed Association & Nissitissit Chapter of Trout Unlimited
- Organization for the Assabet River
- Parker River Clean Water Association
- Taunton River Wild & Scenic Committee
- Turners Falls Water Dept & Montague Conservation Commission
- Waquoit Bay National Estuarine Research Reserve

## On the Ground and In the Rivers

RIFLS crew and volunteers have been busy with data collection, flow measurements, and trainings. By the end of 2006, RIFLS crew and volunteers racked up some major accomplishments:

- Sixteen local groups accounting for **100** volunteers monitor **42** stream gauge locations. These volunteers have collected **3,940** flow observations and logged over **2,213** volunteer hours.
- RIFLS staff completed **155** flow measurements.
- **Nineteen** rating curves were completed.
- In 2006, our third year of certification training (in which volunteer trainers are trained to conduct discharge measurements and train their own volunteers), we certified **six** volunteers from five watersheds.

## Low Flows in a Wet Year?

Despite this year's generally bountiful rainfall several RIFLS rivers experienced low flow or dry conditions again this year.

May 16, 2006

August 25, 2006

**Clapp Brook, Scituate**

This tributary to Scituate's water supply reservoir was dry for much of 2006. RIFLS volunteers believe that construction of the MBTA Greenbush commuter rail bed upstream has diverted flow away from the Clapp Brook watershed and are working with their Conservation Commission on a hydrologic evaluation of the area.

April 28, 2006

March 21, 2006

**Jackstraw Brook, Westborough**

Jackstraw Brook was nearly dry near the town's well even during this wet spring. (See *Highs and Lows,* page 5 for more information.)

July 14, 2006

April 19, 2006

**Pecks Brook, Pittsfield**

The Housatonic Valley Association, Lake Onota Protective Association, and the Pittsfield Conservation Commission are teaming up to monitor downstream flows during summer low flow and lake drawdown/refill periods next year to avoid this year's low flow problem.

## Highlights of 2006

**New Sites, New Volunteers**

RIFLS gauges can now be seen at seven new locations!

- There are two new gauges in Falmouth—one along the Childs River as part of a collaborative effort with the Waquoit Bay National Estuarine Research Reserve and another in the Coonamessett River as part of the Coonamessett Restoration Project.
- Volunteers with the Nashua River Watershed Association are now reading gauges along Witch Brook in Townsend and Varnum Brook in Pepperell. Through a recent EPA Targeted Watersheds Grant they will determine stormwater pollutant loadings for subwatersheds with different land uses by combining their RIFLS flow data and their water quality monitoring data.
- With multiple development projects in the works for Hopkinton, The Friends of Whitehall contacted RIFLS to install a gauge in Whitehall Brook below Whitehall Lake. This gauge, along with the reactivation of a former USGS temporary site downstream, will yield baseline data and guide future withdrawal decisions. Next year, the data may be used to develop baseline nutrient loads for the brook before the planned wastewater treatment plant downstream becomes operational.
- Two new gauges were installed along the headwater tributaries of the Parker River to replace a mainstem gauge rendered useless by beaver activity. This data will provide upstream data to assess withdrawal impacts on the river system.

**RIFLS Sites Ready for Real Time**

RIFLS' success at developing rating curves at specific gauging locations on smaller streams and tributaries has prompted the United States Geological Survey to convert three of our gauges to official real-time USGS sites. These gauges are on the Nissitissit River in Pepperell, the Mattapoisett River in Mattapoisett, and the Eel River in Plymouth. A fourth gauge is planned for conversion on the Parker River in Georgetown, once issues with beavers are resolved (see *Parker River Taken Over By Beavers!,* pg. 5).


**Bring Back the Herring!**

The First Herring Brook Watershed Association and the North and South Rivers Watershed Association continue to work diligently to restore adequate flows for resident fish and outmigration of herring in First Herring Brook. This year, the Selectboard revived the Water Study Committee, and the RIFLS team provided comment letters to DEP on the town's Water Management Permit Five-Year Review and statements to the MA Water Resources Commission during its vote on Scituate's water demand projections. A meeting with the Water Study Committee is scheduled for this January to discuss revising the Town's firm yield

reservoir model to include adequate and consistent downstream flows and enough flow for herring outmigration.

**Rain Barrel Awards Promote Water Conservation**

RIFLS teamed with Adopt-A-Stream to solicit proposals for demonstration projects utilizing rain barrels in public locations to promote water conservation. Eight groups, including watershed associations, town water and highway departments, and nonprofit groups were awarded 25 rain barrels. Some of the awardees included:

- The Housatonic River Watershed Association distributed five barrels to stream team members who have arranged for their installation at schools for use in student gardens.
- Two Mass Audubon sanctuaries were awarded barrels for use in their butterfly gardens, open to the public.
- The Mendon Town Highway Department is utilizing water from the rain barrels that collect rainwater from their facility's roof for use in plantings around town.
- The Cape Cod Groundwater Guardian Team installed a new native garden on the grounds of the Cape Cod Commission building in Barnstable and is watering the garden with rainwater collected from their roof by their rain barrel.

**More Volunteers Certified**

Last June, volunteers from the Nashua River Watershed Association, Waquoit Bay National Estuarine Research Reserve, the Organization for the Assabet River, the Ipswich River Watershed Association, and the North Attleboro Water Department completed the RIFLS Certification Program. The training involved an evening classroom session to review the RIFLS program and get the volunteers familiar with the RIFLS protocol and quality control. In the field session, participants were trained by USGS and RIFLS staff in the use of velocity meters to measure stream discharge. After a solo measurement on their own rivers within two months of the training, participants became certified to train new RIFLS volunteers for their sites and conduct the once yearly stream discharge measurement to ensure the accuracy of their data. Thanks to Charlie Leighton and Linda Comeau of the USGS for their help with this year's training.

In 2006, our third year of certification training, RIFLS staff instituted follow-up reporting to help volunteers keep what they learned fresh in their minds. Finding that volunteers do better with repeated experiences of measuring discharge, RIFLS now requires that participants complete a discharge measurement on their own within two months of the training date, with results sent into RIFLS staff. This year we certified six volunteers from five watersheds to conduct the annual rating curve check.

Trainees measure stream flow on the Quinebaug River during the annual RIFLS Certification Training in June.

*Riverways is pleased to be offering the Certification Program again this spring. If you or another current RIFLS volunteer is interested in participating, please contact Margaret Kearns at (617)-626-1533.*

**Action Planning Meetings**

Numerous RIFLS groups took part with RIFLS staff in action planning meetings in the winter and spring of 2006.

- The Nashua River Watershed Association met in February to discuss data from existing gauges (Gulf Brook, Nissitissit River) and to explore options for new gauges. As a result, two new gauges were installed on Varnum Brook in Pepperell and Witch Brook in

***Highlights continued***

Townsend. (See *New Sites, New Volunteers,* pg. 3 for more information.)

- The Jones River Watershed Association had a great turn-out for their meeting in May, with seasoned and new volunteers attending. Irene Caldwell, the Jones River Heritage Center's temporary volunteer coordinator, rallied the troops for an informative presentation by RIFLS staff and a lively discussion of the issues facing the watershed. Data will be used to inform dam management and fish passage planning. New volunteers were assigned to existing and new gauges to strengthen data collection efforts.
- First Herring Brook Watershed Initiative volunteers met with RIFLS staff in February and have subsequently used their data to address local concerns about requested increases in water withdrawals and storage capacities of existing reservoirs to accommodate planned development. Also of concern was the impact of construction of the Greenbush extension of the commuter rail line on Clapp Brook and First Herring Brook. Stream flow data was used to comment on the construction project. Additionally, data will be used to comment on the need for increased flows for herring restoration (see *Bring Back the Herring!* pg. 3).
- Parker River Clean Water Association volunteers met in May to discuss Georgetown's Water Management permit review and the low flow issues already experienced by the Parker River.
- Housatonic Valley Association staff and volunteers met in February to discuss completion of rating curves and uses of data for lake drawdown management. As a result of these discussions, a meeting was called in May with representatives from HVA, DEP, DFW, local conservation commissions, and Riverways (see the feature article, *Dam Management,* on pg. 7).

## Issues in 2006

**Parker River Taken Over By Beavers!**

Like many communities, the towns in the Parker River watershed are struggling with stream flow issues. Water withdrawals are placing strain on the Parker River which prompted the Parker River Clean Water Association to contact RIFLS for two gauge installations: one upstream and one downstream of Georgetown's largest well. After several months of data collection, the upstream site was made ineffective by beaver activity downstream. RIFLS staff reviewed the watershed and found that installing gauges on each of the two headwater tributaries feeding into the Parker River would be suitable replacements.

However, we found that the beavers are more widespread than we had thought. Wild fluctuations in flows occurred while RIFLS staff was measuring discharges at one of the tributaries. Following the stream revealed a registered irrigation withdrawal for home landscaping at one residence and the daily unclogging of beaver debris along a culvert running under a private driveway at another residence. RIFLS is working with the landowner to secure assistance and funding to ameliorate this problem. In addition the downstream gauge on the Parker has also become impacted by beaver activity. A Vermont-based designer/installer of beaver deceivers has been contacted and will work with Georgetown in the spring to try to correct both of these problems.

Difficulties encountered while measuring discharge: a water pump used for a registered withdrawal (left) and a homemade beaver deceiver (right) on an upstream tributary of the Parker River.

***Issues continued***

**Highs and Lows**

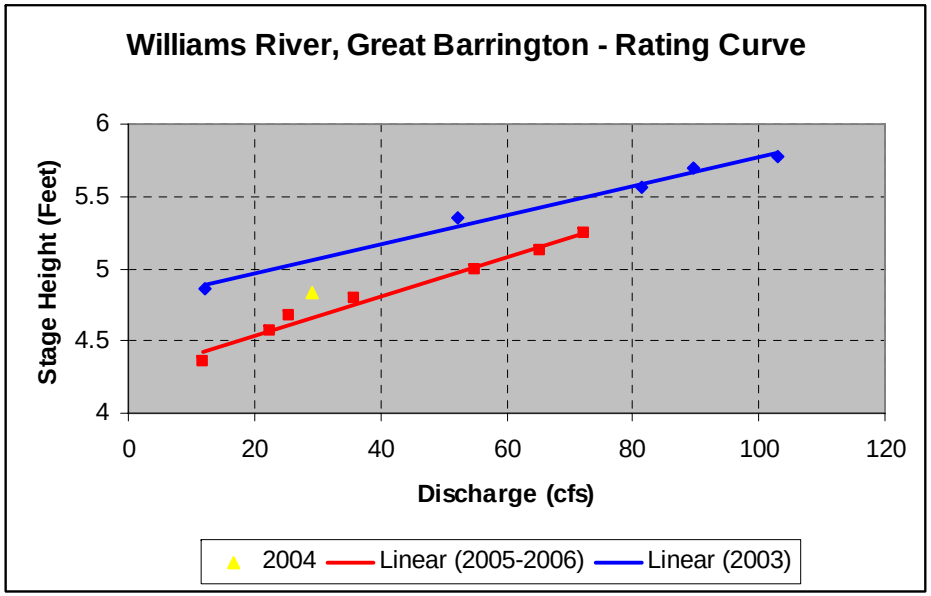
Westborough's Jackstraw Brook reflects the extreme variations experienced by many rivers in Eastern Massachusetts. Poorly planned development has led to increased flooding during large storm events, while increased well pumping during low flow periods desiccates streams and rivers. Jackstraw Brook showcases these issues within a half-mile distance. (See photos below and additional photos of Jackstraw in *Low Flow in a Wet Year?,* pg. 2) These issues encouraged RIFLS to coordinate a public meeting in which representatives from the Town of Westborough, DEP, USGS, DCR, as well as RIFLS volunteers and concerned citizens discussed well withdrawals and low impact development retrofits. An immediate result was the installation of a staff gauge located in the brook adjacent to the town's well.

Jackstraw Brook during summer flows (left)
and immediately after the October 2005 hurricane (right).

Public meeting participants "in the field" at Jackstraw Brook along Warren Road in Westborough. Options for mitigating extreme flood events—such as stream bank plantings, installing meanders, and culvert cleanouts—were discussed.

**Splitting Curves**

As this year's heavy rainfall has shown quite dramatically, changes in streambeds can occur rapidly and can cause large shifts in the rating curve. Last spring's heavy rainstorms on May 14 were likely responsible for changes in the Saugus River near the RIFLS gauge in Lynnfield. Also, repeated flow measurements at the Williams River RIFLS gauge in Great Barrington in 2006 have shown an alteration to the stream channel which most likely occurred in 2004 or early 2005. New rating curves were developed for these sites this year.




The Williams River experienced a change in its channel, causing a shift in the rating curve sometime in 2004 or 2005. The upper lines show the 2003 measurements and the lower lines show the 2005-2006 measurements, with the lone 2004 point not quite fitting either line.

## Feature Article: Dam Management

**By Margaret Kearns, Watershed Ecologist, Riverways Program**

Many of our readers have probably heard about Riverways' dam removal projects that help to restore natural river flows, sediment and nutrient transport, and habitat connectivity. While dam removal is almost always beneficial to rivers, there are some dams that may never be removed because they serve other functions for our society, such as water supply, flood control, recreation, or hydropower. The impact of these dams on the health of downstream rivers varies greatly with the size of the dam as well as the way it is managed and maintained.

Dams that have a small capacity to impound water relative to the size of the river that is dammed will generally "spill" water over the top for much of the year. This means that, during these periods, inflow and outflow are approximately equal and natural flow is unaffected. These small dams generally have their greatest impact during the summer, when the water level falls below the lip of the dam and downstream flow is directly controlled by the manipulation of boards or gates. Dams that impound large areas relative to their rivers' watersheds tend to spill much less frequently and require more attention to management year-round. These dams are often referred to as 'storage' dams. Because flows are almost completely controlled at a storage dam, there is usually much less variability in daily stream flow than in naturally flowing rivers. Care must be taken to ensure that the magnitude, timing, rate of change, frequency, and duration of downstream flows are within appropriate limits for the river system.

Maintaining the balance between the needs of the impounded area and the needs of the river can be a daunting task for the many agencies, towns, and lake associations responsible for managing dams. The science of instream flow is a rapidly evolving field, and there are already many methods for estimating how much water a river really needs to maintain a healthy ecosystem. Some methods, such as the US Fish and Wildlife Service's Aquatic Base Flow Policy, are based on minimum flows alone. The Nature Conservancy's Range of Variability (http://www.nature.org/initiatives/freshwater/files/howmuchh2o.pdf), method uses statistical analyses to create acceptable ranges of flow based on actual or modeled flow data. Others, such as the Instream Flow Incremental Methodology (IFIM, http://www.fort.usgs.gov/Products/Software/IFIM/) or MesoHabitat Simulation (http://www.neihp.org/mesohabsim/index.htm), link site-specific stream flow to the amount of habitat that is created in a particular river for specific organisms or life-stages. Some studies have even found relationships between the presence or abundance of certain species and the amount of water available at different times of the year.

How does a dam manager make sense of it all? Currently in Massachusetts, there is no over-arching regulation governing the management of dams for downstream flows. In a few specific situations—including lake drawdown/refill, water supply operations, and hydropower—flow can be mandated under a hodgepodge of current regulations (see *Downstream Flow Regulations* below for more info). However, for most of the year, the vast majority of Massachusetts' 3,000+ dams are managed according to the best judgment of the owner(s).

If your group is interested in proactively managing flow downstream of a dam, we recommend beginning with the following steps:

**1.** Find out the size of the watershed upstream of your dam. The USGS StreamStats program can be used to calculate watershed area (http://ststdmamrl.er.usgs.gov/streamstats/expert.htm).

**2.** Measure downstream flow in the river itself and calibrate the dam gates or boards to these measurements. If possible, measure the inflows to the reservoir as well (large reservoirs will need to account for groundwater inputs, too).

**3.** Know your regulatory downstream flow requirements, if any. (See *Downstream Flow Regulations* for more information.)

**4.** Find out the 'normal' range of monthly flows for your river. The Massachusetts Water Resources Commission (http://www.mass.gov/envir/mwrc/default.htm) is finalizing a report that

describes the natural range of monthly flows for Massachusetts rivers. Natural flows can also be modeled based on stream flow data from nearby USGS long-term gauging stations and local watershed characteristics.

**5.** Periodically check the flow of a nearby, minimally altered USGS real-time stream flow gauge (http://waterdata.usgs.gov/ma/nwis/rt) and compare that flow to the 'normal' range. (Average daily flows for each USGS real-time stream flow gauge are indicated on the website.) A list of minimally altered gauges can be found in USGS' Water-Resources Investigations Report 03-4332 "Evaluation of Streamflow Requirements for Habitat Protection by Comparison to Streamflow Characteristics at Index Streamflow-Gaging Stations in Southern New England (http://pubs.usgs.gov/wri/wri034332/).

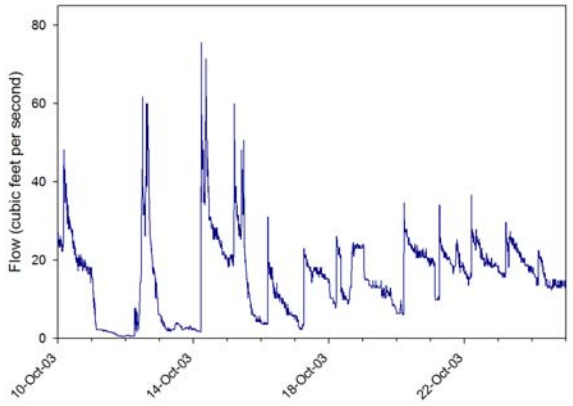
**6.** Manage downstream flow within the 'normal' monthly range. During extreme flow periods, maintain a level similar to a nearby minimally altered USGS real-time gauge (adjust for differences in watershed size). Matching inflow to outflow is another good management rule of thumb, if inflow (including groundwater inputs) can be accurately measured.

**7.** Work with your local river group to monitor the health of the river.

**8.** Upgrade the physical structure of the dam and/or gate system to enable downstream flow to be adequately managed and to provide for fish passage, if necessary.

**Dams & RIFLS**

In 2003, the Housatonic Valley Association (HVA) joined the RIFLS program with the goal of focusing on the management of dams in the Housatonic River Valley. One of their first sites was Larrywaug Brook, which flows out of Lake Mahkeenac (a.k.a. Stockbridge Bowl), a recreational lake in Stockbridge. In 2003 the Division of Fisheries and Wildlife sampled fish in Larrywaug Brook and found a surprising lack of flow-dependent species given the otherwise excellent habitat. Management of stream flow at the Lake Mahkeenac dam was one possible explanation. The lake association was interested in increasing their lake drawdown to help control aquatic weeds but needed approval from the local Conservation Commission, who in turn needed more information about the ability to manage downstream flow within the Generic Environmental Impact Report guidelines (see *Downstream Flow Regulation*).




Impacts of Mahkenac Lake drawdowns on Larrywaug Brook

The first two years of data collection revealed that leaves and other debris were clogging the outlet of the lake during the drawdown period, causing downstream flow to surge when the leaves were cleared away each morning and then dry up to a trickle as the debris built up again. This problem, compounded with above average rainfall, caused unsuccessful lake drawdown attempts two years in a row and highly unnatural stream flow and habitat conditions for downstream organisms. Since that time, HVA has worked with the town and the lake association to raise awareness of the issue, measure downstream flows, devise a trash rack with wider spacing that needs less maintenance, and create a working group to oversee operation of the dam that includes the Conservation Commission and Board of Selectmen, the Lake Association, and the Department of Public Works. This working relationship resulted in far fewer daily disruptions to the natural flow regime as well as a successful lake drawdown this past year.

HVA expanded their focus on dam management this year by partnering with RIFLS, town commissions, and lake associations to monitor stream flow in Peck's Brook downstream of Lake Onota in Pittsfield, the West

Branch Housatonic River downstream of Pontoosuc Lake in Pittsfield, and Bennett Brook downstream of Ashmere Lake in Hinsdale. The data and relationships that are formed between lake and river associations and town commissions will be invaluable as the groups continue to balance the needs of impoundments with the needs of downstream rivers.

Two new groups focused on improving dam management also joined the RIFLS program this year. The Friends of Whitehall is spearheading a flow monitoring effort on Whitehall Brook in Hopkinton downstream of Lake Whitehall and the Lake Shirley Improvement Corporation recently installed staff gauges in Catacunemaug Brook downstream of Lake Shirley and two of the lake's major inflowing tributaries.

Looking to the new year, the management of stream flow from Lake Ashmere to Bennett Brook has brought together local, state, and non-profit stakeholders to take a better look at coordinating multiple interests and to examine the operation of state-owned dams and those that control flow into state-designated Areas of Critical Environmental Concern (ACEC). Riverways is looking forward to working with the ACEC program, Office of Dam Safety, Water Resources Commission, Department of Conservation and Recreation, and the Executive Office of Environmental Affairs to re-examine how stream flow is managed at state facilities.

**Downstream Flow Regulations**

Wetlands Protection Act – lake drawdown and refill

The water level in many recreational lakes is lowered for the winter in an attempt to help control problem weeds and aid in the maintenance of docks and other structures. Contrary to the natural flow regime, this practice increases the flow of rivers in the fall when the lake level is lowered and decreases downstream flow in the spring when the lake is refilled. This practice is regulated under the Massachusetts Wetlands Protection Act by local Conservation Commissions and the Department of Environmental Protection. The Eutrophication and Aquatic Plant Management in Massachusetts Generic Environmental Impact Report (http://www.mass.gov/dcr/waterSupply/lakepond/geir.htm, see pages 4-11 to 4-29) contains guidelines for regulating downstream flows that are based on the US Fish and Wildlife Service's Aquatic Base Flow (ABF) policy. This policy identifies protective seasonal low flows that are based on the US Geological Survey's long-term stream flow records for 48 New England rivers. The summer value of 0.5 cubic feet per second per square mile of upstream watershed area (cfsm) is based on the median August flow from these rivers. The fall and winter guideline is 1.0 cfsm, and the recommendation for the spring snowmelt and fish migration season is 4.0 cfsm. Site-specific studies show that some rivers may naturally flow at higher or lower levels than these general guidelines indicate. However, the Generic Environmental Impact Report recommends that downstream flows remain within the natural range of annual flows (0.5 to 4.0 cfsm) during lake drawdown and refill periods, although it is recognized that this practice may still result in unseasonably low or high flows that may negatively impact downstream aquatic habitat.

Water Management Act – water supply systems

The management of water supply reservoirs is regulated by the MA DEP under the Water Management Act. The regulations seek to maintain a balance between water supply and environmental needs. Each system is reviewed in detail and the resulting water management permit may require that water conservation measures be implemented when the river reaches a low flow, that certain withdrawal points cease to operate during low flow periods, and/or that adequate downstream releases be required from reservoir systems.

National Environmental Policy Act - hydropower

The operation of hydropower dams is regulated by the Federal Energy Regulatory Commission (FERC), which must give equal consideration to development and environmental issues. FERC's review of hydropower projects typically involves consultations with the US Fish and Wildlife Service, state natural resource agencies, and other interested stakeholders before an Environmental Impact Report or Assessment is completed pursuant to the National Environmental Policy Act. Final FERC licenses may be conditioned to required minimum or seasonal downstream flows, acceptable rates of change in flow, and/or structural upgrades to enable better management of downstream flow.